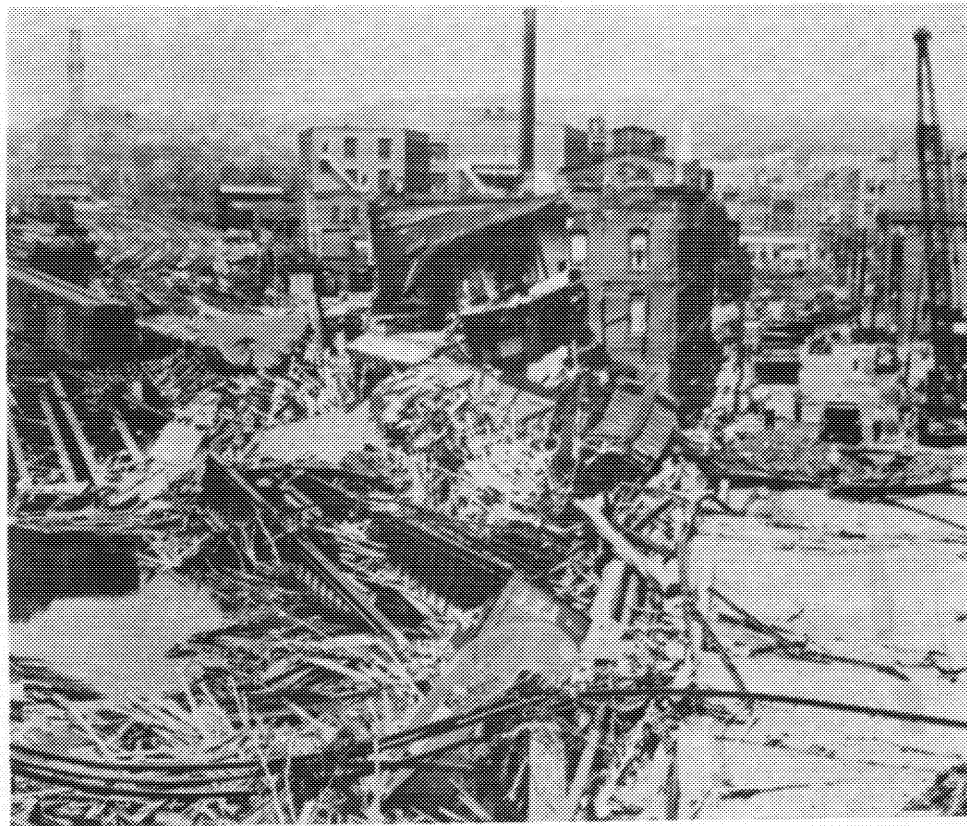
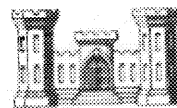


NEW ENGLAND FLOODS OF 1955



PART 4 FLOOD DAMAGES



*Corps of Engineers, U.S. Army - Office of the Division Engineer
New England Division - Boston, Mass.*

NEW ENGLAND FLOODS OF 1955

PART 4

FLOOD DAMAGES



*Corps of Engineers, U.S. Army - Office of the Division Engineer
New England Division - Boston, Mass.*

APRIL 1956

NEW ENGLAND FLOODS OF 1955

PART IV - FLOOD DAMAGES

FOREWORD

This is Part IV of a report in five parts on New England Floods of 1955. The complete report presents the results of preliminary studies and investigations of the floods which occurred in New England as a result of the tropical storms of August and October 1955. The scope of data included in the report is limited to the material useful to the Corps of Engineers in studies pertaining to flood control investigations.

The complete report consists of five parts:

- | | |
|----------|---------------------------------------|
| Part I | - Storm Data |
| Part II | - Flood Discharges |
| Part III | - Flood Profiles |
| Part IV | - Flood Damages |
| Part V | - Effect of Flood Control
Projects |

NEW ENGLAND FLOODS OF 1955

PART IV - FLOOD DAMAGES

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NEW ENGLAND FLOODS OF 1955

PART IV - FLOOD DAMAGES

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PART IV - FLOOD DAMAGES

GENERAL INTRODUCTION

1. Scope and Purpose. - Part IV describes the distribution and nature of the damages and the amount of the losses sustained in southern New England as a result of the 1955 floods. The August and October flood losses are treated separately. The data incorporated in the report were obtained largely through field surveys. Supplemental information was also obtained from other public agencies and public utilities. The loss information will serve as a basis for determining the economic justification of flood control measures.

2. Floods of 1955. - In the summer and fall of 1955, southern New England areas suffered great damage from two major floods. The first flood occurred in mid-August and the second in mid-October. Of the two floods, the flood of August, which raised havoc in a widespread area throughout Massachusetts, Rhode Island, and Connecticut, caused by far the greater losses. The impact of the October flood, though severe, was concentrated in southwestern Connecticut and, although it produced record losses in some areas, the over-all loss was less than one-tenth as large as the August flood loss.

FLOOD OF AUGUST 1955

1. Introduction. - The wrath of the August 1955 flood, which caused losses of over \$530 million in southern New England and took 90 lives, was

concentrated in the Blackstone, Thames, lower Connecticut and Housatonic River Basins. Main stem flood losses, except on the Blackstone River, were dwarfed by those on tributaries such as the Quinebaug and French Rivers in the Thames River Basin, the Farmington, Westfield, and Chicopee Rivers in the Connecticut River Basin, and the Naugatuck River in the Housatonic River Basin.

2. Staggering losses were dealt to communities which hug the watercourses in each of these basins. The losses sustained in the Naugatuck Valley of Connecticut alone amounted to over \$220 million. Flooding of minor streams, such as the Charles and Neponset Rivers in eastern Massachusetts, also caused significant losses. Indeed, some of the more spectacular forms of damage resulted from rampaging flows in headwater streams, such as the Mad River in the Winsted area of Connecticut and Cady Brook in the Southbridge area of Massachusetts. This flood produced more total destruction of dwellings, bridges, dams, roadbeds and other structures than any previous flood in the history of New England.

3. In the following paragraphs, the August 1955 flood damages are described largely within the framework of the major river basins, beginning with the Blackstone River Basin in the east. The distribution of the August flood losses by river basin and state is shown on Table IV-1. Principal damage centers are shown on Plate IV-1.

BLACKSTONE RIVER BASIN

4. General. - The valley of the Blackstone River is thickly populated and has been heavily industrialized for many years. Some of the

Table IV-1 - Total Flood Losses

Flood of August 1955

<u>River Basin</u>	<u>Massachusetts</u>	<u>Connecticut</u>	<u>Rhode Island</u>	<u>Total</u>
Housatonic	\$ 2,170,000	\$ 255,830,000	\$ -	\$ 258,000,000
Connecticut	43,510,000	86,030,000	-	129,540,000
Thames	34,480,000	27,200,000	-	61,680,000
Blackstone	39,060,000	-	28,830,000	67,890,000
Minor Streams	14,020,000	300,000	-	14,320,000
	<hr/>	<hr/>	<hr/>	<hr/>
Total	\$ 133,240,000	\$ 369,360,000	\$ 28,830,000	\$ 531,430,000

LOSS OF LIFE

<u>River Basin</u>	<u>Massachusetts</u>	<u>Connecticut</u>	<u>Rhode Island</u>	<u>Total</u>
Housatonic	-	45	-	45
Connecticut	2	32	-	34
Thames	8	-	-	8
Blackstone	2	-	-	2
Minor Streams	-	-	1	1
	<hr/>	<hr/>	<hr/>	<hr/>
Total	12	77	1	90

earliest textile mills in New England grew up along the narrow flood plains of the river and its tributaries, taking advantage of the available water for power and processing. Although several of the smaller towns and villages remain as "one industry" textile communities, the industry of the valley has become more complex and diversified. The manufacture of various products, such as heavy machinery, machine tools, abrasives, plastics, jewelry, and rubber goods has taken root and prospered, particularly in the major centers such as Worcester, Massachusetts and Woonsocket, Rhode Island.

5. Over 80 percent of the damage caused by the August flood occurred along the main stem of the Blackstone River and on its headwater tributaries in Worcester, Massachusetts. Although flooding extended from the headwaters in and near Worcester to tidewater at Pawtucket, the heaviest damage within the basin was experienced in the middle and upper reaches of the Blackstone Valley, in an area delimited, in general, by the major damage centers of Worcester and Woonsocket.

6. The total loss of the August flood in the Blackstone River Basin amounted to an estimated \$67,890,000, representing 13 percent of the total damage sustained in the southern New England flood area. Of the total damage in the basin 57 percent occurred in Massachusetts, the remainder in Rhode Island. Almost three-quarters of the total damage in the basin occurred in two of the valley's most heavily industrialized centers: Worcester, Massachusetts and Woonsocket, Rhode Island. Flood emergency expenditures of \$2,470,000 under Public Law 875 (81st Congress, 2nd Session) in the Blackstone River Basin were almost equally divided between the two states. Losses by area and type are set forth in Table IV-2.

Table IV-2 - August 1955 Flood Losses

Blackstone River Basin
(Loss in \$1,000)

<u>Area</u>	<u>Urban</u>	<u>Rural</u>	<u>Industrial</u>	<u>Utility</u>	<u>Highway</u>	<u>Railroad</u>	<u>Total</u>
<u>MASSACHUSETTS</u>							
Worcester and Vicinity	4,610.	-	20,900.	1,540.	1,730.	200.	28,980.
Worcester to Mass.-R.I. Line	<u>1,450.</u>	<u>20.</u>	<u>4,430.</u>	<u>40.</u>	<u>2,650.</u>	<u>230.</u>	<u>8,820.</u>
Sub-Total	6,060.	20.	25,330.	1,580.	4,380.	430.	37,800.
<u>RHODE ISLAND</u>							
Woonsocket and Vicinity	5,750.	-	10,040.	470.	3,970.	1,180.	21,410.
Woonsocket Area to Tidewater	<u>1,060.</u>	<u>-</u>	<u>4,450.</u>	<u>40.</u>	<u>350.</u>	<u>310.</u>	<u>6,210.</u>
Sub-Total	<u>6,810</u>	-	<u>14,490.</u>	<u>510.</u>	<u>4,320.</u>	<u>1,490.</u>	<u>27,620.</u>
Total	12,870.	20.	39,820.	2,090.	8,700.	1,920.	65,420.
Emergency Expenditures - Public Law 875 (81st Congress, 2nd Session)							<u>2,470.</u>
Grand Total Basin							67,890.

7. Worcester Area. - The portion of the basin which includes the industrial City of Worcester, Massachusetts, the third largest city in New England, and the adjoining towns sustained an estimated total loss of nearly \$29,000,000. The industrial development of this part of the basin is reflected in the fact that about 70 percent of the estimated total flood loss was industrial. Although a few of Worcester's larger industries, such as the American Steel and Wire Company, suffered a large share of the industrial loss, more than 60 manufacturing concerns suffered heavy, and in many cases, crippling damages. The heaviest industrial losses occurred in the southeastern section of the city from the flood waters of the Middle and Blackstone Rivers. A dam belonging to a textile company at Stillwater Pond breached, and the released waters caused extensive structural, stock, and machinery losses in two textile companies. One of the more severe industrial losses in the city was suffered when flood waters raged through the American Wire and Steel Company's extensive plants which hug both banks of the river between Ballard and Millbury Streets.

8. Residential and commercial damages in the city, representing about 15 percent of the total loss, were especially high in the area of the confluences of the Tatnuck, Beaver, and Kettle Brooks at the head of the Middle River. A similar condition developed where the Mill Brook flows into the middle River to form the Blackstone. Widespread areas in the city were flooded under as much as 10 feet of water. Dams were washed out and thousands of feet of sewers throughout the city were clogged and damaged. Close to a thousand dwellings and more than 300 commercial establishments in the Worcester area were affected.

9. Worcester Area to Massachusetts State Line. - Losses in the Blackstone River Valley from Worcester to the Massachusetts-Rhode Island state line amounted to over \$8,800,000. This loss represents about 13 percent of the estimated total damage in the basin. The town of Northbridge was the hardest hit and damages in Uxbridge, Millville, and Blackstone were heavy.

10. Industrial loss accounted for over half of the total damage in this area of the basin. Most of the industrial damage occurred in the towns of Northbridge, Millville, and Millbury. The industrial plants of almost 30 companies throughout the reach suffered heavy structural losses, including in some instances the total destruction of buildings. Extreme silting accounted for much of the damage to machinery and stock. Residential and commercial losses in the area amounted to over 15 percent of the total. Nearly 250 dwellings and some 60 commercial establishments were damaged.

11. Northbridge and Blackstone together experienced about three-fourths of the urban loss. Rural damage was minor, but damage to town roads, state highways, and railroad lines was extensive, amounting to one-third of the total damage. In Northbridge, two steel truss bridges were destroyed and road washouts occurred at many points; 200 feet of Hartford Avenue in Uxbridge was gouged out to depths of 10 to 15 feet.

12. Woonsocket Area. - The Blackstone and Mill Rivers inflicted heavy damage, amounting to \$21,400,000, in the Woonsocket area in Rhode Island. Particularly severe damage occurred around the confluence of the Mill and Peters Rivers close to the center of the city. The

majority of the city's industrial concerns and mills are clustered along the banks of these rivers and their tributary brooks. The damage inflicted by the flood on Woonsocket industries amounted to almost half of the entire loss in the city. About 30 companies experienced damage and several of the large concerns suffered losses of more than \$1,000,000. The swift current of the floodwater throughout these reaches within Woonsocket, augmented by the failure of a large dam, was responsible for much of the destruction. Not only were the foundations gutted and whole walls torn out of some of these mills, but whole buildings were destroyed and washed away. The Alice plant of the U.S. Rubber Company on Fairmount Street on the south bank of the Blackstone River, the city's biggest employer, suffered heavy damage.

13. Urban damage was very heavy. More than 200 dwellings and over 130 commercial establishments suffered damage. One of the largest concentrations of residential and commercial damage within the city occurred in the so-called Social District, when the dam at Harris Pond, which impounds waters on Mill River, washed out. Tons of sand and debris were deposited on mill floors. Several dwellings were totally destroyed and more than 100 tenement houses in this area had to be evacuated. A serious health hazard was created by the heavy deposits of muck and debris on the streets and in the basements of the buildings.

14. Highway and bridge losses represented almost one-fifth of the loss in the area. The bridges at River Street and Privilege Street were washed out, four more were damaged beyond repair, and 13 others sustained minor damage. The damage to sewers, catch basins, culverts, city streets,

highways, and railroad lines was extensive. In several places, where the current washed out whole sections of the roads, the city's water mains were ruptured.

15. Woonsocket Area to Tidewater. - The loss in the valley between Woonsocket and tidewater in Pawtucket amounted to about 14 percent of the total loss in the basin. The heaviest damage center south of Woonsocket was the town of Cumberland. Industrial losses represented over 70 percent of the total loss in this area. Cumberland suffered industrial losses far in excess of any other community. The swollen river gouged out foundations, washed out bridges and retaining walls, and in some places destroyed and washed away whole buildings. The swift current of the floodwater was again a telling factor, not only in Cumberland, but in the remaining towns in the area. In Pawtucket the 200-foot Blackstone Avenue bridge was demolished and swept downstream, and valuable city records were lost when the city hall was flooded two feet over the first floor. Urban losses and damage to highways and roads were heavy in Cumberland and Central Falls also. Heavy damage to railroad lines occurred in Cumberland and Lincoln.

THAMES RIVER BASIN

16. General. - The Thames River Basin has a long history of industrial development, and today most of the basin's population, estimated at 241,000 in 1950, is concentrated in the many industrial towns which dot the main river and its principal tributaries in Massachusetts and Connecticut.

17. The total loss resulting from the August flood was \$61,680,000, representing some 12 percent of the loss in southern New England. More

than half of the damage and all of the eight lives lost in the Thames River Basin occurred in Massachusetts. About 50 percent of the emergency expenditures of \$3,690,000 under Public Law 875 (81st Congress, 2nd Session) were also used in the Massachusetts portion of the basin. The French River and upper reaches of the Quinebaug River together accounted for almost 60 percent of the total loss in the basin. Major damage centers include Southbridge and Webster, Massachusetts and Putnam, Connecticut. Although flooding occurred throughout the western part of the basin, the losses were comparatively small. Losses by area and type are shown on Table IV-3.

18. Upper Quinebaug River Area. - Flooding of the Quinebaug River and Cady Brook in the area above the confluence with the French River caused nearly 40 percent of the total loss in the basin. The heaviest loss by far was experienced in the area of Southbridge and Charlton, Massachusetts. Southbridge, flooded by the waters of the Quinebaug River and Cady Brook, was the hardest hit community in the basin, with a loss amounting to nearly one-third of the basin loss.

19. Southbridge industries were particularly hard hit, with losses of over 70 percent of the city total. Cady Brook, which flows southward through Charlton to the Quinebaug at Southbridge, caused heavy residential and commercial damage along its entire length. The failure of the Glenacho Lake dam on this brook created a great surge of water which tore 12 houses from their foundations and claimed four lives in Charlton. In Southbridge, 4 more houses were washed away and 17 demolished. Much of the damage to homes resulted from pounding by the heavy debris being swept downstream.

Table IV-3 - August 1955 Flood Losses

Thames River Basin
(Loss in \$1,000)

<u>Area</u>	<u>Urban</u>	<u>Rural</u>	<u>Industrial</u>	<u>Utility</u>	<u>Highway</u>	<u>Railroad</u>	<u>Total</u>
<u>MASSACHUSETTS</u>							
Upper Quinebaug R.	4,520.	-	14,950.	-	4,080.	70.	23,620.
French R.	<u>1,520.</u>	<u>-</u>	<u>5,780.</u>	<u>-</u>	<u>1,190.</u>	<u>520.</u>	<u>9,010.</u>
Sub-Total	6,040.	-	20,730.	-	5,270.	590.	32,630.
<u>CONNECTICUT</u>							
Upper Quinebaug R.	90.	20.	160.	-	-	-	270.
French R.	430.	-	1,280.	10.	560.	850.	3,130.
Lower Quinebaug R.	3,660.	30.	8,050.	1,200.	2,280.	810.	16,030.
Willimantic-Shetucket R.	<u>680.</u>	<u>10.</u>	<u>1,870.</u>	<u>100.</u>	<u>3,270.</u>	<u>-</u>	<u>5,930.</u>
Sub-Total	<u>4,860.</u>	<u>60.</u>	<u>11,360.</u>	<u>1,310.</u>	<u>6,110.</u>	<u>1,660.</u>	<u>25,360.</u>
Total	<u>10,900.</u>	<u>60.</u>	<u>32,090.</u>	<u>1,310.</u>	<u>11,380.</u>	<u>2,250.</u>	<u>57,990.</u>
Emergency Expenditures under Public Law 875 (81st Congress, 2nd Session)							<u>3,690.</u>
Grand Total Basin							61,680.

Damage from heavy silting was also great. In some buildings, the weight of up to five feet of silt caused first floors to collapse. Almost 400 dwellings in this reach were damaged and more than 30 of this number were completely destroyed. More than 100 commercial establishments also suffered damage, ranging from flooded basements to complete loss of stock and buildings.

20. Although most of the industrial loss in Southbridge was caused by the Quinebaug River, Cady Brook was also responsible for a large share. The American Optical Company, at the confluence of Cady Brook and the Quinebaug, was especially hard hit. Dikes which the company had constructed after previous flooding proved ineffective; they were not only overtopped, but in some places broken through by pounding from structures from upstream. Rural damage in the reach was light, but the highway systems suffered heavily as whole sections of roads were washed out.

21. French River Area. - Flood damage in the French River area amounted to one-fifth of the total loss in the basin. The town of Webster, which suffered over one-third of this loss, was the principal damage center. The towns of Dudley, Massachusetts and Thompson, Connecticut also sustained heavy losses.

22. About 30 companies suffered flood damage in Webster. Several textile mills built along the banks of the French River were heavily damaged and in some instances whole mill buildings were destroyed and washed away. Although industrial damage caused by the French River accounted for almost 60 percent of the total loss, residential and commercial damage was also heavy. Almost 200 dwellings were damaged and over

50 commercial establishments suffered losses. Two of the town's bridges were washed out and much land was eroded. One section of Chase Avenue was gouged out to a depth of six feet when the river cut a new channel. Damage to roads, highways, and railroad lines in the area was severe, accounting for over one-quarter of the loss. In Oxford, when the Old Mill Pond dam gave way, a channel 150 feet wide and up to 40 feet deep was cut through Route 20.

23. Lower Quinebaug River Area. - The towns along the Quinebaug River below the confluence with the French River, from Mechanicsville, Connecticut in the north to Jewett City in the south, suffered a total loss of over \$16,000,000 or some 26 percent of the basin total. The town of Putnam, Connecticut, located only a few miles below the confluence of the Quinebaug and French Rivers, was the hardest hit community in this area, suffering over half of the total loss.

24. Residential and commercial damage in Putnam was nearly as high as the industrial loss, amounting to almost one-third of the total. The strong current was responsible for much of the destruction. Heavy industrial and commercial damage was caused along Providence and Main Streets, where foundations were gutted by the current and some buildings totally destroyed. Many stores suffered a total loss of stock. Several houses on Meadow and Pomfret Streets, along with the adjacent land in some places, were swept downstream, and 12 others were demolished. A 200-foot railroad trestle was also carried away. In the area of Middle and Arch Streets, the extreme depth of the water in some places flooded structures over the second story level. More than 200 dwellings in the city were damaged and over 40 commercial establishments suffered losses. Damage to railroad lines in Putnam amounted to about one-tenth the total loss.

25. Residential and commercial losses in the other communities were severe, especially in the Killingly area. The industrial loss in Plainfield was high, surpassed only by the loss in Putnam. Damage to roads and highways was heavy in Pomfret, Plainfield and Killingly, amounting to one-tenth of the total loss.

26. Willimantic-Shetucket River Area. - Flood damage along the Willimantic-Shetucket Rivers occurred in a widespread area which is, in general, less highly populated and less heavily industrialized than the eastern part of the basin. The total loss amounted to about 10 percent of the loss in the basin. Regulation provided by the Mansfield Hollow Flood Control Reservoir appreciably reduced the over-all loss in this area. Industries in the town of Stafford sustained nearly all of the industrial damage. Residential, commercial, and highway damages accounted for most of the remaining loss, since rural losses and damage to railroad lines were slight.

CONNECTICUT RIVER BASIN

27. General. - The areas of Massachusetts and Connecticut which experienced damaging floods from three of the principal tributaries of the lower Connecticut River are some of the most densely populated and highly industrialized areas of the whole Connecticut River Basin. The larger population centers, however, like Hartford and Springfield, which are protected by completed flood control works, were spared serious damage. The industries, which include several large aircraft manufacturers, are well diversified and close to large markets. Manufactured products cover a

wide range, including tools and other metal products, machinery, textiles, and paper. Agricultural development, besides poultry raising and truck farming, includes cultivation of important and valuable tobacco crops in the lower part of the basin.

28. Flood damage in the Connecticut River Basin was confined largely to three principal tributaries: the Westfield and Chicopee Rivers in Massachusetts, and the Farmington River in Connecticut. Flood damage from the main stem of the Connecticut River was relatively light, but smaller tributary areas experienced severe losses. Enormous losses were experienced in such places as Winsted and Farmington in Connecticut, and Westfield and Palmer in Massachusetts. The Connecticut River and its tributaries were responsible for the loss of 32 lives in the state of Connecticut and two in Massachusetts. The combined losses sustained along these three principal tributaries, amounting to \$98,700,000 and representing nearly one-fifth of the loss in southern New England, exceed the losses of either the Thames or the Blackstone River Basins. The Farmington River was by far the most destructive of the three. About one third of the \$10,610,000 emergency expenditure in the basin under Public Law 875 (81st Congress, 2nd Session) was used in Connecticut. Losses for the Connecticut River Basin by area and type are shown on Table IV-4.

29. Farmington River Area. - Flooding in the Farmington River Basin caused destruction along the main stem and its tributaries, amounting to a loss of over \$70,000,000. Severe damage was inflicted throughout the watershed, particularly in the western portion. Many of the communities located along the river, such as Barkhamsted, New Hartford, Canton, and

Table IV-4 - August 1955 Flood Losses

Connecticut River Basin
(Loss in \$1,000)

<u>Area (s)</u>	<u>Urban</u>	<u>Rural</u>	<u>Industrial</u>	<u>Utility</u>	<u>Highway</u>	<u>Railroad</u>	<u>Total</u>
<u>MASSACHUSETTS</u>							
Westfield R.	2,740.	810.	3,120.	270.	4,600.	940.	12,480.
Chicopee R.	2,000.	280.	7,780.	170.	3,160.	1,180.	14,570.
Farmington R.	140.	-	-	-	1,950.	-	2,090.
Main R. and Other	<u>250.</u>	<u>-</u>	<u>-</u>	<u>480.</u>	<u>4,540.</u>	<u>1,850.</u>	<u>7,120.</u>
Sub-Total	5,130.	1,090.	10,900.	920.	14,250.	3,970.	36,260.
<u>CONNECTICUT</u>							
Farmington R.	17,820.	460.	17,450.	5,980.	25,040.	2,810.	69,560.
Main R. and Other	<u>6,060.</u>	<u>-</u>	<u>5,380.</u>	<u>90.</u>	<u>940.</u>	<u>640.</u>	<u>13,110.</u>
Sub-Total	<u>23,880.</u>	<u>460.</u>	<u>22,830.</u>	<u>6,070.</u>	<u>25,980.</u>	<u>3,450.</u>	<u>82,670.</u>
Total	29,010.	1,550.	33,730.	6,990.	40,230.	7,420.	118,930.
Emergency Expenditures - Public Law 875 (81st Congress, 2nd Session)							10,610.
Grand Total							129,540.

Farmington, suffered heavy losses; but it was the Mad and Still Rivers which created the greatest havoc. These small and usually placid streams which join in the town of Winsted caused damage in the Winchester (Winsted) area that amounted to about half of the damage in the whole Farmington River Basin. Highway losses were heavy throughout the basin and in total represent the largest single type of loss.

30. The heavy concentration of destruction is reflected in the fact that Winsted, though a small industrial community of less than 10,000 suffered a loss of more than \$30,000,000. When the spillway of Highland Lake above Winsted was topped by four to five feet, the resulting torrent gouged out a new channel up to 75 feet wide and 30 feet deep down the hillside, roared through the buildings of two industrial plants in its path, and buried stock and machinery under tons of stone and silt. In Winsted the Mad River, swollen to enormous size, cut a new channel through the center of the town, scouring out close to a mile of Main Street, with all its utility lines, to a depth of 10 to 15 feet. Not only did the majority of stores and commercial establishments along Main Street suffer a complete loss of stock, but on this street alone almost 60 buildings were destroyed, and at least 12 of them, including two gas stations and a three and one-half story hotel, were undermined and washed away. Industrial losses were heavy, amounting to almost one-third of the total loss; residential and commercial damage, however, was even heavier. Highway losses were severe, and the town was divided when five bridges over the Mad River were washed out and another badly damaged.

31. Damage was very heavy along the West Branch and the main stem between Barkhamsted and Farmington. Almost one-third of the industrial

damage in the Farmington River watershed was experienced in this reach. Damage to highways and railroad lines was heavy in Barkhamsted, New Hartford, and Farmington. In the watershed below Farmington the industrial losses were comparatively slight, but the residential, commercial and highway damages were heavy in such towns as Simsbury, Avon, and East Granby.

32. Westfield River Area. - Damage caused by the Westfield River and its tributaries in southern Massachusetts amounted to a loss of more than \$12,480,000. Although flood damage was experienced throughout most of the watershed, more than half of the damage was concentrated in the city of Westfield and the nearby town of Russell. Regulation provided by the Knightville Flood Control Reservoir appreciably reduced the overall loss in this area.

33. Approximately 800 dwellings and more than 70 commercial establishments in the Westfield River Basin experienced various degrees of damage, and some 10 buildings were completely destroyed. The city of Westfield, which sustained by far the heaviest loss, was flooded from the main stem of the Westfield River and two of its tributaries, the Little River and Powder Mill Brook. Westfield's urban and industrial losses were heavy, especially in the area of the confluence of the Little River and the Westfield, where the swift current of the floodwater caused heavy damage. Several homes were completely destroyed and a few were broken up and washed away. On Westfield Street 19 trailers were washed out of a camp and swept downstream. Two bridges were also washed out and damage to roads, highways and railroad lines was heavy. About 20 companies in the city experienced damage, representing about 40 percent of the total loss.

34. Flooding along minor tributaries south of Westfield in the Granville-Southwick area was extensive - seven bridges in the small town of Southwick were washed out - but since the area is generally rural, the damage was comparatively slight and confined almost wholly to farm buildings, land, and crops. A number of small farms were damaged, and two large tobacco farms along the river below Westfield suffered heavy losses. A serious erosion loss occurred when acres of rich bottom land of the lower Westfield watershed were washed away.

35. Chicopee River Area. - Flooding of the Chicopee River, one of the principal eastern tributaries of the Connecticut River in southern Massachusetts, caused damages amounting to \$14,570,000. The tributaries of the Chicopee River, especially the Quaboag River, were responsible for over half of the damage. The heaviest damage in the basin occurred in the Palmer-Monson area near the confluences of the Ware, Quaboag, and Swift Rivers, and Broad Brook, which form the Chicopee River.

36. More than half of the \$7,780,000 industrial loss in the basin occurred in the towns of Palmer, Monson, and Chicopee. A textile mill in Monson, which is located on Chicopee Brook, a small tributary, experienced one of the heaviest individual losses in the basin. The swollen brook washed out the company dam and bridge, and undercut a wall of one of the main buildings, causing it to collapse into the stream. Eight other bridges in Monson were washed out, and damage to roads, culverts and water mains was extensive. Industrial damage in Palmer, where an aircraft plant was heavily damaged, was almost as severe as the damage in Monson. Residential and commercial losses were also high. Many of

the stores along Main Street suffered a complete loss of stock and heavy structural damages. The Palmer Street Bridge was washed out, and the town storage building was demolished and swept downstream. Another hard hit area was the city of Chicopee, where the town's industries suffered damages which were almost as heavy as those in Palmer. Damage to railroad lines throughout the basin was comparatively small; a great amount of damage, however, was inflicted upon the roads and highways, accounting for over one-fifth of the total loss.

37. Main River and Lesser Tributary Areas. - Flooding was not a serious problem along the main stem of the Connecticut River during the August flood. Completed local flood protection works minimized the losses in this area. Many of the smaller tributaries in Massachusetts and Connecticut, however, caused serious damages. About two-thirds of the \$20,230,000 loss in this area occurred in Connecticut, especially along small streams and in places where drainage facilities were inadequate to cope with the excessive amounts of water. Highways and railroads suffered a large part of the loss.

HOUSATONIC RIVER BASIN

38. General. - Damage along the main stem of the Housatonic River was not high, but along the Naugatuck River, the largest and most important tributary of the Housatonic, the flood reached the ultimate in devastation and caused concentrated destruction unparalleled by any other flood in the history of New England. The flood waters of the Naugatuck, which raged from Torrington to tidewater in Derby through one of the most densely populated industrial areas in the United States, took 40 lives

and paralyzed the valley's industries. The total loss in the Naugatuck Valley amounted to over \$223,000,000.

39. The Naugatuck Valley is one of the key industrial concentrations in the United States. It is the most important non-ferrous metal manufacturing center in the nation. From these industries come almost 40 percent of the country's brass and bronze industrial shapes and a large part of the aluminum, zinc, and copper products. Other important industries in the basin include clockmaking and the production of rubber footwear.

40. The loss of \$258,000,000 in the lower Housatonic River Basin represents nearly half of the total loss in southern New England. The tremendous destruction caused by the Naugatuck River alone was responsible for all but 14 percent of the basin loss. Almost all of the \$9,860,000 emergency expenditures under Public Law 875 (81st Congress, 2nd Session) were made in the Connecticut portion of the basin, and most of it in the Naugatuck Valley. The rampaging waters of the Naugatuck River, fed by numerous swollen tributaries, created a major disaster area throughout the full 41 miles of its length. The distribution of losses by type in the Naugatuck Valley is shown on Table IV-5.

41. The remainder of the flood losses in the Housatonic Basin occurred largely in the lower reach of the Housatonic main stem and two tributaries, the Shepaug and the Still Rivers. Although the extent of damage in these areas is dwarfed by comparison with the Naugatuck damage, several of the communities, such as the towns of Washington and New Milford and the city of Danbury, were hard hit and suffered extensive damage, including the loss of five lives.

Table IV-5 - August 1955 Flood Losses

Housatonic River Basin
(Loss in \$1,000)

<u>Area</u>	<u>Urban</u>	<u>Rural</u>	<u>Industrial</u>	<u>Utility</u>	<u>Highway</u>	<u>Railroad</u>	<u>Total</u>
<u>MASSACHUSETTS</u>							
Main R. and Other	130.	-	-	-	1,770.	90.	1,990.
<u>CONNECTICUT</u>							
Main R. and Other	6,890.	-	8,410.	160.	6,030.	1,630.	23,120.
Upper Naugatuck R. (Torrington-Water- town)	11,660.	20.	20,570.	2,980.	4,920.	550.	40,700.
Middle Naugatuck R. (Waterbury-Beacon Falls)	34,040.	-	92,210.	1,330.	4,080.	4,620.	136,280.
Lower Naugatuck R. (Seymour-Derby)	10,420.	-	28,360.	800.	3,180.	3,290.	46,050.
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Sub-Total	<u>63,010.</u>	<u>20.</u>	<u>149,550.</u>	<u>5,270.</u>	<u>18,120.</u>	<u>10,090.</u>	<u>246,150.</u>
Total	63,140.	20.	149,550.	5,270.	19,980.	10,180.	248,140.
Emergency Expenditures under Public Law 875 (81st Congress, 2nd Session)							<u>9,860.</u>
Grand Total Basin							258,000.

42. Upper Naugatuck River Area. - The upper portion of the Naugatuck River Basin experienced disastrous flooding from the main stem, the East and West Branches and other tributaries. In the area from the headwaters north of Torrington south through Thomaston and Watertown, flood damages amounted to \$40,700,000, representing nearly one-fifth of the damage in the Valley. All but five percent of the damage in this area was experienced in the industrial centers of Torrington and Thomaston.

43. In Torrington, which suffered a major share of the damage in the upper valley, seven bridges were scoured out and washed away and four others were damaged. As in other areas of the valley, many of the bridges became clogged with debris and were converted into temporary dams. As a result, the impounded water inundated widespread areas to great depth. Much of the damage in the plants of the Torrington division of the American Brass Company, which suffered one of the heaviest individual loss in the city, can be traced to this condition. Industrial damage in Torrington represented over 40 percent of the loss in the city, but damage to residential and commercial property was even greater. In Center Square, one of the hardest hit areas in the city, whole blocks along the riverside were leveled. In the Torrington area a total of 580 dwellings were damaged and 17 of these were completely destroyed. Damage to roads, highways, sewer and water lines was also heavy. Debris covered up to 50 miles of city streets and sections of 11 different roads were washed out.

44. Industrial losses in the comparatively small town of Thomaston were even greater than those in Torrington. The rolling mills of two metal manufacturing companies built along the banks of the river were hard

hit, and the Seth Thomas Clock Company at the confluence of Northfield Brook and the Naugatuck River suffered heavy losses. A plastic manufacturing company, located a short distance above Jackson Street bridge was put out of business, suffering a total loss of machinery, equipment, and stock when flooded with an estimated 17 feet of water before the 120-foot bridge was torn out and swept downstream. Urban damage in Thomaston, although amounting to less than one-tenth of the total loss, was severe along parts of Main Street, River Street, and Treadwell Avenue. Damage to roads, highways, and railroad lines in the Torrington-Thomaston area was severe, amounting to more than 10 percent of the total damage.

45. Middle Naugatuck River Area. - In the middle reach of the Naugatuck River, including Waterbury, Naugatuck, and Beacon Falls, flood damage reached unheard-of proportions. A loss of over \$136,000,000 - more than half the damage in the basin - took place in this short reach. The damage inflicted upon the city of Waterbury, the most heavily populated community in the valley and the center of the brass industry, surpassed by far that of any other single community in the southern New England flood area. Waterbury's loss represents over 40 percent of the Naugatuck River damage. Some idea of the magnitude of this loss can be gained if it is realized that the loss in this city alone exceeds the total losses of either the Blackstone or the Thames River Basins by at least 30 percent. The destruction experienced in the Naugatuck-Beacon Falls area south of Waterbury amounted to about one-third of the damage in the middle reach.

46. More than two-thirds of the loss in Waterbury was suffered by the city's industries. As in many of the Naugatuck Valley's industries which

had experienced previous floods, precautionary measure and "Flood Plans" went into effect when the waters began to rise, but the fury of the Naugatuck at the height of the flood nullified most of this effort. In the southern section of the city of Waterbury, the plant of the Platt Brothers and Company, which extends about 500 feet along the east bank of the Naugatuck, was hit with the full force of the current and almost 300 feet of the plant was leveled to the main floor; a 150-foot steel bridge nearby was gouged out and pushed downstream. The Waterbury division of the American Brass Company, flooded in some of its mills to a height of 17 feet, was another of the many industries in the city which suffered high individual losses. In the city as a whole 45 companies suffered damage.

47. Residential and commercial damage accounted for about one-fourth of the loss in the city. The number of private homes, apartment houses, and commercial establishments along both banks of the river which were totally destroyed and washed away was enormous. The so-called Wards Flats section was one of the many hard hit areas in the city. A dam built by a small mountain of debris at the Bank Street Bridge caused inundation of a wide upstream section. Roads and railroad lines were ripped up and whole blocks of homes were demolished. The destruction was especially heavy on Bank Street and North Riverside Street, where a series of 17 two-story tenements containing about 50 apartments succumbed to the currents and washed away. Four lives were lost when two other two-story dwellings, flooded over the second story, were torn from their foundations, broken up, and swept downstream. Nearly 300 homes in Waterbury were damaged and almost 40 of these were totally destroyed. Damage to roads, highways, and railroad lines in this reach was also severe, accounting for close to one-tenth of the total loss.

48. More than half the damage south of Waterbury was inflicted upon a dozen different industrial concerns in Naugatuck and Beacon Falls. One of the heaviest losses in the area was sustained by the U.S. Rubber Company, which has extensive plants along the river. Damage was heavy along North and South Main Street (Route 8) which parallels the river through Naugatuck and Beacon Falls. The incidence of complete destruction of buildings along the street was exceptionally high. Over 150 structures were damaged and nearly 40 of these were destroyed. Damage to roads and highways was severe, and the railroad system in Naugatuck was also hard hit.

49. Lower Naugatuck River Area. - In the lower reach of the Naugatuck River, through the town of Seymour and the cities of Ansonia and Derby, flood damage amounted to over \$46,000,000, representing about one-fifth of the Naugatuck damages. Nearly two-thirds of the damage was centered in the city of Ansonia. The city of Derby, located at the confluence of the Housatonic and Naugatuck Rivers, was flooded by both streams. Industrial loss in the area was severe, accounting for almost two-thirds the total loss.

50. Most of the \$28,400,000 industrial loss in the area was experienced by a comparatively small number of large concerns. The American Brass Company, whose mills are located on low ground between Canal Street and the river, suffered one of the heaviest losses in the area when some of its buildings were flooded with more than 12 feet of water. The Hershey Metal Products Company plant on Division Street and the Farrel-Birmingham Company plants in Ansonia and Derby were also hard hit. The current caused heavy structural damage, and the heavy deposits of sand and

silt ruined a great amount of machinery, stock, and finished goods in each of these plants.

51. Residential and commercial losses throughout the area were high, amounting to over one-fifth of the total loss. In Seymour, in the area around and below the confluence of Little River and Bladen's Brook, heavy destruction was caused to both urban and industrial property. The Seymour high school on Pine Street was heavily damaged, and the public library on Broad Street was stripped to its foundation. In the area between Bank Street and Derby Avenue, eight two- and three-story buildings were washed away, and 20 others were destroyed. In Ansonia the 380-foot Maple Street Bridge near the Farrel-Birmingham plants was torn down. Urban damage in Ansonia amounted to more than one-fifth of the city's loss. Along Main Street, the hardest hit section in the city, the commercial and residential damage was severe; eight houses and 17 garages in the Main Street and White Place areas were destroyed, and several of the larger stores suffered a complete loss of stock. Derby, flooded by both the Housatonic and Naugatuck, suffered urban damage amounting to about 15 percent of the total loss. The Naugatuck River alone was responsible for more than three-quarters of the damage in the city. Roads and highways were extensively damaged in this area. Many roads suffered complete washouts and deep scouring. Damage to railroad lines was also serious, amounting to more than the highway loss.

52. Main River and Other Areas. - Flood damage outside the Naugatuck Valley, along the Housatonic, Shepaug and the Still Rivers and in lesser tributary areas amounted to \$25,110,000, representing about 10 percent of

the loss in the basin. The heaviest damage, accounting for almost one-third of the total loss in this area, was caused by the Housatonic River. Along the main stem of the Housatonic, damage was experienced from southern Massachusetts to tidewater. The Shepaug River was responsible for about one-fifth of the loss. The Still River and its various small tributaries caused comparatively heavy damage in the city of Danbury.

53. Almost three-quarters of the damage along the main stem occurred in the town of New Milford, and 70 percent of this was industrial. A textile company sustained one of the heaviest losses in the area when its mill building was flooded to a depth of 10 feet, destroying thousands of yards of finished cloth. The industrial losses were also heavy in the Shelton-Monroe area. Damage to roads and highways along the Housatonic was comparatively slight. Lesser tributary areas suffered about one-third of the loss which occurred outside the Naugatuck Valley.

54. The Shepaug River, an eastern tributary of the Housatonic, caused heavy damage in a widespread area, including the towns of Litchfield, Washington, and Roxbury. The town of Washington was the hardest hit, sustaining almost three-quarters of the Shepaug damage. In Washington, the loss was confined entirely to residential and commercial property and roads and highways. The flood waters of the Shepaug moved with great force through Washington. Two bridges were washed out, and heavy damage was caused along Bee Brook Road, Titus Road, and Main Street. In this area, a total of 15 one- and two-story buildings were demolished and swept away. In Washington Depot, three two and one-half story buildings with several stores on the street floors were torn down and washed away. A total of

71 homes in Washington were damaged, and about 20 of these were destroyed. Industrial damage in this area was comparatively slight and confined entirely to the town of Litchfield. The swift current caused particularly heavy damage to roads and highways along the Shepaug, including extensive road washouts in the Washington-Litchfield area. When a double culvert under State Highway 25 became clogged with trees and debris, a wide section of the highway was gouged out.

55. The damage in the city of Danbury and the immediately surrounding areas in the towns of Brewster and Bethel, which sustained about two-thirds of the damage in this portion of the basin, was caused by the Still River, a western tributary of the Housatonic. The area within the city around the confluence of the Kenosia, Kohanza, North Meadow Brooks and the Still River was the hardest hit. Since several of these streams flow under buildings in many areas of the city and are crossed in places by small and constricting bridges, damage within the city was heavy. More than half the loss was suffered by Danbury industries. The fur companies and hat manufacturers, the most important industries in the city, suffered heavy stock losses. Residential and commercial damage occurred in widespread areas throughout the city along the crooked courses of the small tributary streams. Damage to roads and highways in the area was comparatively slight. Railroad lines, however, sustained almost twice the damage of highways.

OTHER CONNECTICUT LOSSES

56. Although most of Connecticut lies within the major basins, there were numerous local flood problems resulting from the August rains in the

coastal areas of the State. Individual losses were generally small as compared to losses in the major basins, but in total they represent a significant loss of \$300,000. Railroad and highway losses make up a large part of the total loss experienced in these coastal areas.

CHARLES, NEPONSET, AND OTHER EASTERN MASSACHUSETTS LOSSES

57. Eastern Massachusetts was not spared the damaging effects of the excessive rainfall during the August storm, even though the losses in this area were small in comparison to those elsewhere in southern New England. Flooding occurred along the Charles and Neponset Rivers, in the headwaters of the Concord River watershed, and in the area drained by lesser coastal streams. Losses in eastern Massachusetts amounted to \$14,000,000.

58. There were numerous local flood problems resulting from inadequate drainage. Individual losses were generally not large in comparison to those experienced elsewhere, but the combined loss was serious. Urban and industrial losses of \$900,000 and \$5,100,000, respectively, occurred along the Charles and Neponset Rivers. Highway and railroad losses were widespread in eastern Massachusetts totaling \$6,984,000. Emergency expenditures under Public Law 857 (81st Congress, 2nd Session) in the area amounted to \$710,000.

FLOOD OF OCTOBER 1955

59. The flood of October 1955 threatened many of the areas which were still staggering from the effects of the August flood. This flood was generally much less destructive than the August flood in terms of the

damage it produced, but was nevertheless a severe flood, claiming 17 lives and causing damages of over \$50,000,000. A breakdown of the October losses by basin or area and State is given in Table IV-6.

60. In the major basins of southern New England, which bore the brunt of the August damage, the October flood losses were comparatively small. However, in southwestern Connecticut, in the areas drained by coastal streams and the southwestern portion of the Housatonic Basin, the October flood and resulting damage were the greatest ever recorded.

61. The October flood produced record losses in the Norwalk, Rippowam and Noroton River watersheds. Major damage centers in these watersheds were the cities of Norwalk and Stamford. Emergency expenditures under Public Law 875, (81st Congress, 2nd Session) in these areas amounted to \$420,000. The Still River in the southwestern portion of the Housatonic Basin also produced record losses, particularly in Danbury. The damage along these streams, as shown in Table IV-7, represents about 57 percent of the October loss. In addition to these streams, others in the coastal areas of southwestern Connecticut produced significant damage, particularly to transportation lines.

62. Of the major basins, the Housatonic suffered by far the largest loss. Not only were losses severe on the Still River, but also on the other tributaries to the lower Housatonic, especially the now notorious Naugatuck River. Had the August storm not produced such catastrophic damage and eliminated damageable property in the Naugatuck Valley, the October losses in this area would have been much higher. Much of the remainder of the October loss was experienced along smaller streams in the

Table IV-6 - October Flood Losses in Southern New England

<u>River Basin</u>	<u>Connecticut</u>	<u>Massachusetts</u>	<u>Rhode Island</u>	<u>Total</u>
Housatonic	\$ 22,530,000	-	-	\$ 22,530,000
Connecticut	1,420,000	\$ 790,000	-	2,210,000
Thames	120,000	-	-	120,000
Blackstone	-	-	\$ 100,000	100,000
Coastal Streams	25,160,000	-	-	25,160,000
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Total	\$ 49,230,000	\$ 790,000	\$ 100,000	\$ 50,120,000

LOSS OF LIFE

<u>River Basin</u>	<u>Connecticut</u>
Housatonic	5
Coastal Streams	12
	<hr/>
Total	17

western portion of the Connecticut River Basin in Connecticut and Massachusetts. Damages produced by small local flood conditions scattered throughout southern New England are only partly reflected in the figures given in Table IV-6.

Table IV-7 - October Flood Losses

Norwalk, Rippowam-Noroton, and Still River Watersheds
(Loss in \$1,000)

<u>River</u>	<u>Urban</u>	<u>Industrial</u>	<u>Utility</u>	<u>Highways</u>	<u>Railroad</u>	<u>Total</u>
Norwalk	3,440.	6,060.	650.	3,090.	640.	13,880.
Rippowam-Noroton	3,400.	620.	260.	2,640.	610.	7,530.
Still	2,400.	4,000.	20.	370.	20.	6,810.
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Total	9,240.	10,680.	930.	6,100.	1,270.	28,220.

